

Claims

-19. An insulated conductor for a high-voltage winding in an electric machine, comprising:

one or more strands;

an inner conductive layer that surrounds said one or more strands;

an insulating layer that surrounds said inner conductive layer; and

an outer conductive layer that surrounds said insulating layer, wherein:

a resistivity of the outer conductive layer being in an inclusive range of 10 through 500 ohm*cm.

20. An insulated conductor as claimed in claim 19, wherein:

the outer conductive layer is grounded at at least two different points.

21. An insulated conductor as claimed in claim 20, wherein:

said outer conductive layer having a resistivity being lower than that of the insulating layer but higher than that of a material that comprises said one or more strands.

22. An insulated conductor as claimed in claim 19, wherein:

the resistivity of the outer conductive layer being in an inclusive range of 50 through 100 ohm*cm.

23. An insulated conductor as claimed in claim 19, wherein:

a resistance per axial length unit of the outer conductive layer being in an inclusive range of 5 through 50000 ohm/m.

24. An insulated conductor as claimed in claim 19, wherein:
a resistance per axial length unit of the outer conductive layer being in an inclusive range of 500 through 25000 ohm/m.

25. An insulated conductor as claimed in claim 19, wherein:
a resistance per axial length unit of the outer conductive layer being in an inclusive range of 2500 through 5000 ohm/m.

26. An insulated conductor as claimed in claim 19, wherein:
said outer conductor including a base polymer and a carbon black,
a resistivity of the outer conductive layer being set by
a type of the base polymer,
a type of the carbon black, and
a proportion of the carbon black relative to an entire formulation of said outer conductive layer.

27. An insulated conductor as claimed in claim 26, wherein:
the base polymer comprises an ethylene butyl acrylate copolymer of EP-rubber.

28. An insulated conductor as claimed in claim 25, wherein:
the outer conductive layer being cross-linked by peroxide.

29. An insulated conductor as claimed in claim 26, wherein:
the outer conductive layer being cross-linked by peroxide.

30. An insulated conductor as claimed in claim 19, wherein:
an adhesion between the insulating layer and the outer conductive layer being of a same order of magnitude as an intrinsic strength of a material that forms said insulating layer.

31. An insulated conductor as claimed in claim 19, wherein:
the inner conductive layer, the insulating layer and the outer conductive layer are extruded on the one or more strands.

32. An insulated conductor as claimed in claim 30, wherein:
the inner conductive layer, the insulating layer and the outer conductive layer are applied through extrusion through a multilayer head.

33. An insulated conductor as claimed in claim 19, wherein:
the insulating layer being a crosslinked polyethylene, XLPE.

34. An insulated conductor as claimed in claim 19, wherein:
the insulating layer being at least one of ethylene propylene rubber and silicone rubber.

35. An insulated conductor as claimed in claim 19 wherein:
the insulating layer being a thermoplastic material from a set of LDPE, HDPE, PP, PB, and PMP.

36. An electric machine comprising:

an insulated conductor for a high-voltage winding, having

- one or more strands,
- an inner conductive layer that surrounds said one or more strands,
- an insulating layer that surrounds said inner conductive layer, and
- an outer conductive layer that surrounds said insulating layer, wherein:

a resistivity of the outer conductive layer being in an inclusive range of 10 through 500 ohm*cm. .

37. A rotating electrical machine comprising:

an insulated conductor for a high-voltage winding, having

- one or more strands,
- an inner conductive layer that surrounds said one or more strands,
- an insulating layer that surrounds said inner conductive layer, and
- an outer conductive layer that surrounds said insulating layer, wherein:

a resistivity of the outer conductive layer being in an inclusive range of 10 through 500 ohm*cm.

38. An insulated conductor for a high-voltage winding in an electric machine, comprising:

- means for conducting an electrical current in said high-voltage winding,
- means for electrically insulating said means for conducting, said means for electrically insulating having,
 - means for creating a first equipotential surface around said means for conducting,
 - means for creating a second equipotential surface around said means for

creating the first equipotential surface, and

means for separating said first equipotential surface from said second equipotential surface; and

means for setting a resistivity of the means for creating a second equipotential surface to avoid glow discharge and limit eddy current losses.

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CLAIMS

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1. An insulated conductor (10) for high-voltage windings in electric machines, characterized in that the insulated conductor (10) comprises one or more strands (12), an inner, first conductive layer (14) surrounding the strands (12), a first insulating layer (16) surrounding the inner, first conductive layer (14) and an outer, second conductive layer (18) surrounding the first insulating layer (16), and the resistivity of the second conductive layer (18) is between 10-500 ohm*cm.
2. An insulated conductor (10) as claimed in claim 1, characterized in that the conductive layer (18) is earthed at at least two different points along the insulated conductor (10).
3. An insulated conductor (10) as claimed in claim 2, characterized in that the resistivity of the second conductive layer (18) is lower than that of the insulation layer (16) but higher than that of the material of the strands (12).
4. An insulated conductor (10) as claimed in claim 3, characterized in that the resistivity of the second conductive layer (18) is between 50-100 ohm*cm.
5. An insulated conductor (10) as claimed in claim 1, characterized in that the resistance per axial length unit of the second conductive layer (18) is between 5-50000 ohm/m.
6. An insulated conductor (10) as claimed in claim 1, characterized in that the resistance per axial length unit of the second conductive layer (18) is between 500-25000 ohm/m.
7. An insulated conductor (10) as claimed in claim 1, characterized in that the resistance per axial length unit of the second conductive layer (18) is between 2500-5000 ohm/m.
8. An insulated conductor (10) as claimed in any of the preceding claims, characterized in that the resistivity of the second conductive layer (18) is determined by varying the type of base polymer and varying the type of carbon black and the proportion of carbon black.

9. An insulated conductor (10) as claimed in claim 7, characterized in that the base polymer is chosen from ethylene butyl acrylate copolymers of EP-rubber.
10. An insulated conductor (10) as claimed in claims 7-8, characterized in that the second conductive layer (18) is cross-linked by peroxide.
11. An insulated conductor (10) as claimed in any of the preceding claims, characterized in that the adhesion between the insulation layer (16) and the second conductive layer (18) is of the same order of magnitude as the intrinsic strength of the insulation material.
12. An insulated conductor (10) as claimed in any of the preceding claims, characterized in that the first conductive layer (14), the insulating layer (16) and the second conductive layer (18) are extruded on the conductive strands (12).
13. An insulated conductor (10) as claimed in claim 11, characterized in that all layers are applied through extrusion through a multi layer head.
14. An insulated conductor (10) as claimed in any of the preceding claims, characterized in that the insulating layer (16) is a crosslinked polyethylene, XLPE.
15. An insulated conductor (10) as claimed in any of the preceding claims, characterized in that the insulating layer (16) is made of ethylenepropylene rubber or silicone rubber..
16. An insulated conductor (10) as claimed in any of the preceding claims characterized in that the insulating layer (16) is made of a thermoplastic material as LDPE, HDPE, PP, PB, PMP.
17. An electric machine comprising an insulated conductor as claimed in any of claims 1-16.
18. An rotating electrical machine comprising an insulated conductor as claimed in any of claims 1-16.

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